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## **A New Halacarid Genus (Acari: Halacaridae: Halacarinae) from the Great Meteor Seamount, Eastern North Atlantic**

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Adults and juveniles of a new halacarid genus and species, *Acanthohalacarus reticulatus*, are described. Adults and nymphs are characterized by numerous spines on the legs; these adjunct spines are arranged in rows and are most conspicuous on the telofemora and tibiae. They are lacking in larvae. The possible function of the spines is discussed.

**Key Words:** marine mite, Halacarinae, *Acanthohalacarus*, new genus, new species, description, North Atlantic.

### **Introduction**

The first halacarid mite from Europe was described by Baster (1758, fig. 7) more than 200 years ago. In the following centuries the numbers of species and genera increased, and by the end of the 20th century 29 marine halacarid genera with 209 species had been recorded from the Eastern North Atlantic. Nonetheless, the marine mite fauna of this region is far from completely known, as recently collected meiofauna from the Great Meteor Seamount demonstrated. Eleven halacarid species had been recorded from this seamount (Bartsch 1973a–c), but new collections contained species and a genus new to science; the latter is described here.

### **Area Investigated and Methods**

The Great Meteor Seamount, at 30°N and 28–29°W, lies south of the Azores, west of Madeira and the Canary Islands, and almost 1,700 km off the coast of Morocco. The seamount has a rather even plateau at a depth of 290–400 m that covers an area of approximately 1,200 km<sup>2</sup>. The steep slopes, falling to the seafloor at more than 4,000 m depth, are interrupted by terraces at 450 m and 550 m depth (Pasenau 1971; Ulrich 1971). The sediment is dominated by biogenic calcareous deposits and porose limestone (Schott *et al.* 1969); a coral reef is on the terrace at 450 m depth (Pasenau 1971).

On the plateau of the Great Meteor Seamount, sediment samples were taken

with a box corer and epibenthic sledge. The material was fixed onboard with buffered 4% formalin (Martinez Arbizu and Schminke 2000). The meiofauna was extracted and sorted in the laboratory in Oldenburg (University of Oldenburg) under the supervision of Drs P. Martinez Arbizu and K. H. George.

The halacarid mites were cleared in lactic acid and mounted in glycerin jelly. The holotype and some paratypes are deposited in the Zoologisches Institut und Zoologisches Museum, Hamburg (ZMH), further paratypes in the Museum für Naturkunde der Humboldt Universität, Berlin (MNHUB) and the Senckenberg Museum, Frankfurt (SMF).

Abbreviations used in the description are: AD, anterior dorsal plate; AE, anterior epimeral plate; d, dorsal; dl, dorsolateral; dm, dorsomedial; ds-1 to ds-5, first to fifth pairs of dorsal idiosomatic setae; GA, genitoanal plate; glp-1 to glp-4, first to fourth pairs of gland pores; GO, genital opening; OC, ocular plate(s); P-2 to P-4, second to fourth palpal segments; pas, parambulacral seta(e); PD, posterior dorsal plate; PE, posterior epimeral plate(s); pgs, perigenital setae; sgs, subgenital setae; vl, ventrolateral; vm, ventromedial. Legs numbered I to IV.

### Systematics

#### Halacarinae Viets, 1927

#### *Acanthohalacarus* gen. nov.

**Diagnosis** (adults). Dorsum with AD, PD, and pair of OC, five pairs of idiosomatic setae, and four pairs of gland pores. AD and PD each with pair of pores, OC with two pores. Adanal setae on anal cone. Venter with AE, pair of PE, and GA. AE and PE with adjunct setae. Female GA with up to five pairs of pgs, male GA with numerous pgs. Gnathosoma with one pair of maxillary setae on gnathosomal base, one pair on rostrum. Palps four-segmented, attached laterally. P-2 with one distodorsal seta; P-3 with medial spur; P-4 with three setae in basal whorl. Genua of legs much shorter than adjoining segments. Tibiae and telofemora with ventromedial and ventrolateral, dorsomedial and dorsolateral rows of short spines. Tarsus I with one ventromedial seta and rows of eupathidia; tarsi II to IV with ventral setae. Solenidion on tarsus I in dorsolateral position, on tarsus II dorsomedial. Apices of all tarsi with pair of claws and central sclerite ending in small claw-like process.

**Type species.** *Acanthohalacarus reticulatus* sp. nov.

**Remarks.** The genus *Acanthohalacarus* is most similar to *Bathyhalacarus*. The chaetotaxy of the tarsi is the same in the two genera, and in both taxa the OC bear an anterior and posterior gland pore, and three or more dorsal setae on the PE. In contrast to *Bathyhalacarus* and the majority of halacarid genera, *Acanthohalacarus* bears several rows of spines on the legs.

Amongst the halacarid genera, a large number of spines on the legs is found in the marine genus *Enterohalacarus* and the freshwater genus *Astacopsiphagus*. *Enterohalacarus* is represented by a single species, *E. minutipalpus* Viets, 1938, which was extracted from echinoids in the Molucca Sea and is believed to be a parasite (Viets 1938). *Astacopsiphagus parasiticus* Viets, 1931, the unique representative of its genus, was taken from gills of a freshwater parastacid crayfish (Viets 1931); the only record is from eastern Australia. Both these forms have distinctly fewer setae

on the legs, and the gnathosoma is smaller, than in *Acanthohalacarus*. In *Enterohalacarus* the palps are very short, two-segmented, and less than half as long as the rostrum; in *Astacopsiphagus* both the palps and the rostrum are very short; in contrast, *Acanthohalacarus* has an elongate rostrum and its palps are long and slender, extending beyond the rostrum.

The most common setation in a halacarid idiosoma is that the dorsum bears five pairs of setae and one pair of terminal adanal setae, while the venter bears three pairs of setae within the AE and one dorsal and two or three ventral setae on the PE. In *Acanthohalacarus* the number of idiosomatic dorsal setae agrees with that commonly present in halacarids, but the numbers of ventromarginal and dorsal setae on the AE and PE, respectively, are increased. In *A. reticulatus* sp. nov. there are two adjunct setae in the area representing epimeron II and seven to nine adjunct setae on the PE anterior to the insertion of leg III. Adjunct setae within the AE are also known in species of the genera *Rhombognathus*, *Lohmannella*, and *Agauides* (Newell 1984; Bartsch 1988). An increased number of setae on the PE is present in *Rhombognathus*, *Agauide*, *Bathyhalacarus*, *Bradyagaue*, and *Halacarellus* (Newell 1984; Bartsch 1982, 1997). The number of adjunct setae is often variable within a genus, hence it is not a reliable phylogenetic character.

***Acanthohalacarus reticulatus* sp. nov.**

**Material examined.** *Holotype*. Male, ZMH, R.V. METEOR, Cruise 42/3, St. 521, 30°05.9'N, 28°23.2'W, 511 m, 14 September 1998. *Paratypes*. Four females, six males, three deutonymphs, five protonymphs, three larvae, ZMH; one male and one deutonymph, MNHUB; one male, SMF; collecting data as above.

**Description.** *Male*. Length of idiosoma 450–520  $\mu\text{m}$ ; holotype 452  $\mu\text{m}$  long, 277  $\mu\text{m}$  wide. Dorsal plates reticulate (Fig. 1A). AD 110  $\mu\text{m}$  long, 102  $\mu\text{m}$  wide, with anterior margin truncate. Diagonal length of OC 125  $\mu\text{m}$ , width 55  $\mu\text{m}$ . PD 212  $\mu\text{m}$  long, 127  $\mu\text{m}$  wide. Pair of glp-1 at lateral margins of AD level with insertions of leg I. Pores glp-2 at anterolateral margins of paired OC; pores glp-3 near posterior angles of OC, each adjacent to sigmoid slit and following pore canaliculus. Pair of glp-4 in posterior part of PD. Dorsal setae small; ds-1 on AD immediately medial to gland pores; ds-2, ds-3, and ds-4 within membranous integument; ds-5 on PD. Adanal setae on either side of anal cone, seen both in dorsal and ventral aspect.

Ventral plates delicately punctate. AE 174  $\mu\text{m}$  long, 250  $\mu\text{m}$  wide, with five pairs of setae: one seta on epimeron I, three setae on epimeron II, and one pair of setae ventrally (Fig. 1B). Each PE of holotype with seven marginal setae anterior to insertion of leg III and four ventral setae; other males with nine marginal and five ventral setae. GA 187  $\mu\text{m}$  long, 120  $\mu\text{m}$  wide; GO 52  $\mu\text{m}$  long, 37  $\mu\text{m}$  wide. GA of holotype with 41 pgs close around GO and 14 outlying ones, in other males 32–46 pgs near GO and 11–14 outlying ones, in total 45–57 setae. Genital sclerites with five pairs of sgs, two anterior and three posterior. Spermatopositor short, extending anteriad to level of most anterior pair of pgs (Fig. 1D).

Gnathosoma 155  $\mu\text{m}$  long, 80  $\mu\text{m}$  wide (Fig. 1F). Integument of gnathosomal base delicately punctate. Rostrum 57  $\mu\text{m}$  long, 30  $\mu\text{m}$  wide, reaching to end of P-3. Rostral sulcus extending halfway along rostrum. Pharyngeal field large. Tectum truncate (cf. Fig. 1C, F). Palps slender. P-2 with long dorsal seta. P-3, as in female

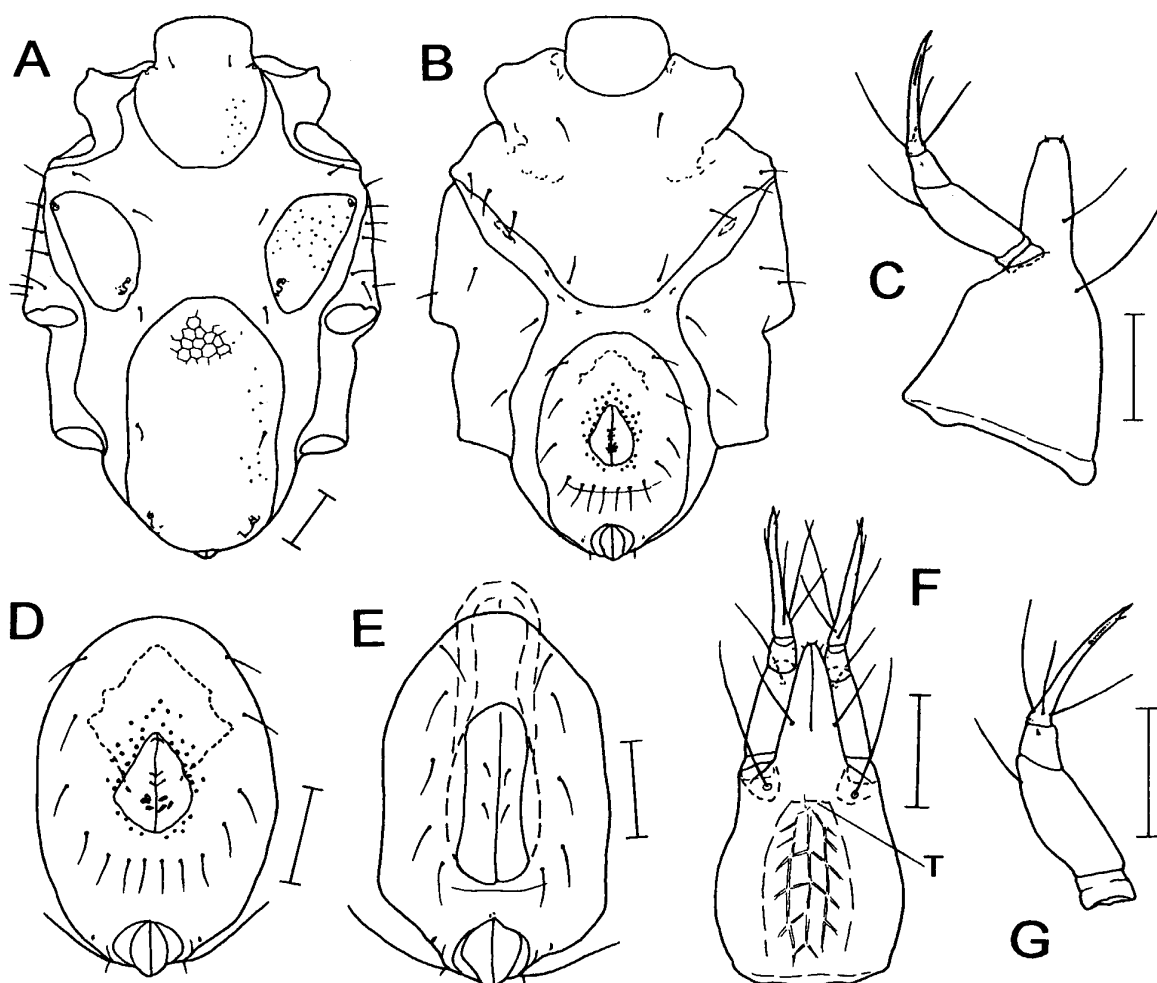


Fig. 1. *Acanthohalacarus reticulatus* sp. nov. A, idiosoma, dorsal, male; B, idiosoma, ventral, male; C, gnathosoma, lateral, female; D, genitoanal plate, male; E, genitoanal plate, female; F, gnathosoma, ventral, male; G, palp, medial, female. T, tectum. A, B, D, and F from holotype. Scales=50  $\mu$ m.

(Fig. 1G), with delicate spur. P-4 with three setae in basal whorl, one lateral seta (solenidion) in posterior half, and one setula and two spurs apically.

Legs slender. Telfemora and tibiae long and slender. Telfemur I 3.2 times longer than high (Fig. 2A); other telfemora shorter, less slender (Fig. 2B–D). Tibiae longer than telfemora. Genua short. Leg chaetotaxy (from trochanter to tibia): leg I, 1, 3, 46, 5, 51; leg II, 1, 5, 36, 5, 42; leg III, 7–8, 5, 26–27, 4, 39–40; leg IV, 6, 4, 26–27, 4, 47. Telfemora and tibiae with four rows of hollow spines. Arrangement of spines on holotype telfemur I, 1d/11dl/12dm/12vl/10vm; on telfemur II, 1d/8dl/10dm/9vl/8vm; on telfemur III, 2–3dl/9dm/10vl/5vm; and on telfemur IV, 2–3dl/9dm/9vl/6vm. Setae on holotype tibia I, 2d/11dl/12dm/13vl/13vm; on tibia II, 2d/8dl/9dm/12vl/11vm; on tibia III, 1d/7dl/10dm/11–12vl/10vm; and on tibia IV, 1d/8dl/13dm/12vl/13vm. With slight variations in numbers of setae both between left and right and among individuals (Fig. 2E, F). Apicalmost of ventromedial spines on tibia II long, slender, and delicately bipectinate; other spines almost smooth. All

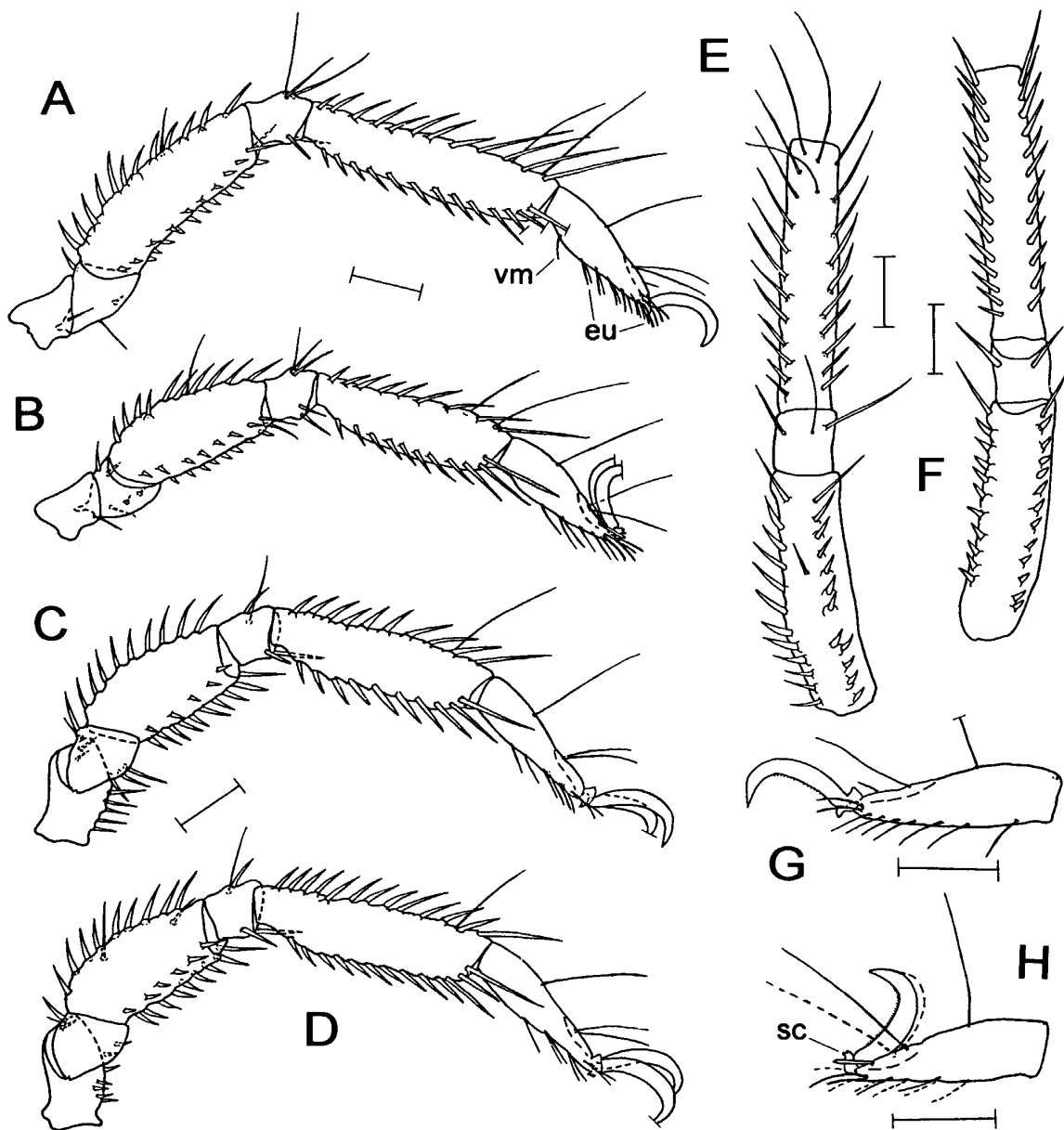


Fig. 2. *Acanthohalacarus reticulatus* sp. nov. A, leg I, medial, male; B, leg II, medial, male; C, leg III, medial, male; D, leg IV, medial, male (A–C, dorsolateral setae of telofemora omitted; A–D, dorsolateral and ventrolateral setae of tibiae omitted); E, telofemur to tibia I, dorsal, male (ventral setae omitted); F, telofemur to tibia I, ventral, male (dorsal setae omitted); G, tarsus I, lateral, male (medial setae and claw omitted); H, tarsus II, medial, female (lateral setae and claw in broken line). eu, eupathidia; sc, claw-like process of central sclerite; vm, ventromedial seta. A–D and G from holotype. Scales=50  $\mu$ m.

tarsi with narrow fossa membranes. Tarsus I with dorsal seta, pair of setae on fossa membranes, solenidion on dorsolateral fossa membrane, ventromedial seta near base of segment, six ventrolateral and six ventromedial eupathidia, and pair of doubled pas (Fig. 2A, G). Tarsus II with claviform solenidion on dorsomedial fossa membrane and six eupathidia and pair of doubled pas ventrally (cf. Fig. 2H).

Tarsi III and IV with six and five ventral setae, respectively, and pair of pas singlets.

Claws large; J-shaped pecten with numerous very delicate tines; accessory process vestigial. Central sclerite with small claw-like process (cf. Fig. 2H).

*Female.* Length of idiosoma 510–541  $\mu\text{m}$ . Dorsal aspect as in male. Paratype specimen, 510  $\mu\text{m}$  long, with GA 194  $\mu\text{m}$  long, 112  $\mu\text{m}$  wide, and GO 90  $\mu\text{m}$  long, 47  $\mu\text{m}$  wide. Five pgs on either side of GO (Fig. 1E). Ovipositor passing slightly beyond anterior margin of GA. Genital sclerites with two pairs of sgs.

*Deutonymph.* Length of idiosoma 345–387  $\mu\text{m}$ . Dorsal plates reticulate. PD much shorter than in adults (Fig. 3A). Striae of membranous integument intensely anastomosing. Numbers and arrangement of setae and gland pores as in adults. AE with pair of adjunct setae; PE with three to four adjunct setae. Genital and anal plate separate (Fig. 3B). Genital plate with two pairs of pgs and two pairs of internal genital acetabula. Shape and chaetotaxy of gnathosoma similar to that of adults. Number of setae on legs from trochanter to tibia: leg I, 1, 3, 30, 5, 37; leg II, 1, 4, 26, 5, 28; leg III, 4, 4, 17, 5, 28–29; leg IV, 2, 3, 12, 4, 28–32. Numbers of solenidia and dorsal setae of tarsi I to IV as in adults. Tarsus I (Fig. 3C) with one ventromedial and 8–12 ventral setae; tarsi II to IV with four, four, and two ventral setae, respectively. Each tarsus ending with pair of pas.

*Protonymph.* Length of idiosoma 255–430  $\mu\text{m}$ . OC and PD much smaller than in adults. AE with three pairs of setae; PE with four setae: one dorsal, one marginal, two ventral. Small genital plate with pair of internal genital acetabula. Legs slender. Number of setae from trochanter to tibia: leg I, 1, 1, 15, 5, 22; leg II, 1, 2, 11, 4, 15; leg III, 2, 2, 8–9, 4, 16–17; leg IV, 0, 0 (basifemur)+3–4 (telofemur), 4, 11–12. Tarsus I with one ventromedial and six ventral setae (Fig. 3D); tarsi II, III, and IV with two ventral setae each. Each tarsus with pair of pas.

*Larva.* Length of idiosoma 215  $\mu\text{m}$ . AD subrectangular. OC and PD much smaller than in adults (Fig. 3E). AE with two pairs of setae (Fig. 3F). PE short, with only one ventral seta. Anal plate small. Legs I (Fig. 3G) to III very slender, five-segmented, lacking adjunct setae. Leg chaetotaxy (without pas and solenidia): leg I, 1, 1 (basifemur)+3 (telofemur), 4, 10, 6; leg II, 1, 1+3, 4, 7, 4; leg III, 1, 1+2, 3, 7, 4. Dorsal/ventral setae on tibia I to III: 4/6, 3/4, and 3/4, respectively. Dorsal/ventral setae on tarsi I to III (ventromedial seta included, solenidia excluded): 3/3, 3/1, 3/1, respectively. Claws very slender.

**Remarks.** The life style of *Acanthohalacarus reticulatus* is not known. Characters that may give hints are the large numbers of setae both on the legs and the epimeral plates, and the size of the pharyngeal plate.

Most conspicuous are the numerous strong setae on the leg segments and the PE, those on the legs being hollow spines. The setae do not arise from large pori as setae with mechanoreceptory function assumedly do. An intense spinosity is otherwise not known within the taxon Halacaridae. The dorsal idiosomatic setae are small, their number not increased over the usual total for this subfamily. The inconspicuous setation of the dorsum, in contrast to the spinosity of the legs, and the much lower numbers of setae on the dorsolateral (outer) flank than on the medial (inner) flank of telofemora III and IV, contradict the idea that the spines on the legs are defensive, protecting the mites from predators. The adjunct setae on the epimeral plates and the spines on the legs might enable the mites to stick to a larger animal or protect them from the defensive agents of inhabited animals. The

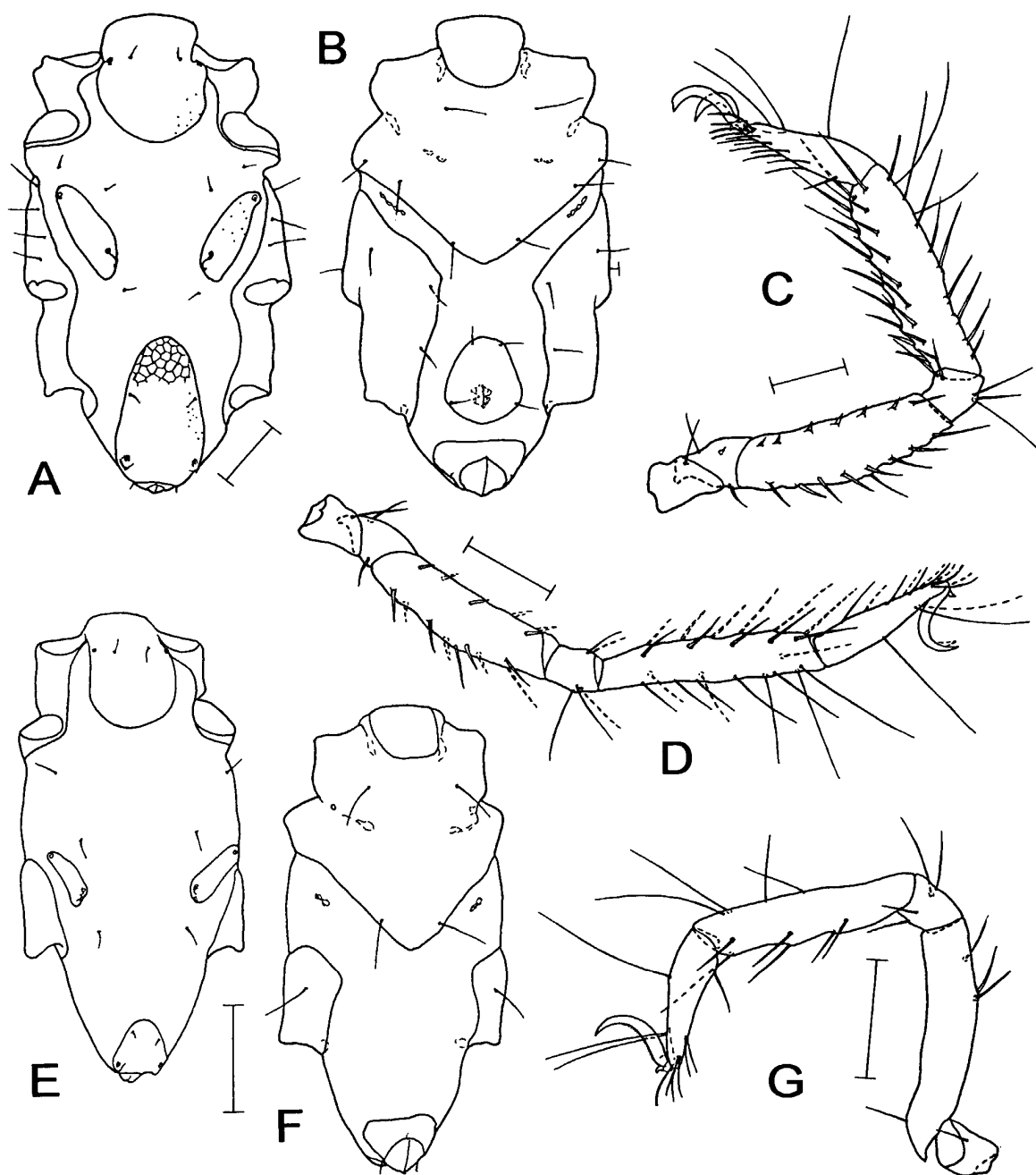


Fig. 3. *Acanthohalacarus reticulatus* sp. nov. A, idiosoma, dorsal, deutonymph; B, idiosoma, ventral, deutonymph; C, leg I, medial, deutonymph (dorsolateral and ventrolateral setae of telofemur and dorsolateral setae of tibia omitted); D, leg I, medial, protonymph (dorsolateral and ventrolateral setae of telofemur and tibia, and lateral claw, in broken line); E, idiosoma, dorsal, larva; F, idiosoma, ventral, larva; G, leg I, medial, larva (lateral claw omitted). Scales = 50  $\mu$ m.

legs and the epimera of the larvae lack adjunct setae and hence the presumed protection. In contrast to the adults, the larvae are smaller in size and have very slender legs. These characters might enable a life on the same substratum as the adults

without further adaptation. In the following developmental stages setae are added to the legs, and in the deutonymphs adjunct setae appear both ventromarginally and dorsally on the epimeral plates. Hence the nymphs gain an adaptation similar to that of the adults.

The pharyngeal plate is an area on the gnathosoma with compartments and muscle scars; the plate is large in *Acanthohalacarus reticulatus*. Halacarids, as do other prostigmatid mites (Di Sabatino *et al.* 2000), feed by sucking up preorally digested food material. Enlarged pharyngeal plates, like those of the new species, are present in *Australacarus* and *Colobocerasides*, genera which are suspected of being parasitic (Bartsch 1987, 1993, 1998); parasitism thus cannot be ruled out for *Acanthohalacarus*.

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